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Illinois Transportation Plan

Forecast of Highway User Characteristics/Revenues 1980-2000

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March 1979

Technical Report

Illinois Department
of Transportation

ILLINOIS TRANSPORTATION PLAN

FORECAST OF HIGHWAY USER
CHARACTERISTICS/REVENUES
1980-2000

A TECHNICAL REPORT

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INTRODUCTION AND SUMMARY

An integral part of the planning process is the projection of revenues. In this paper, highway user revenues are forecasted for the period 1980-2000.

A review of the growth of some of the most important variables over the last twenty years will provide a background setting.

Variable	1957 Value	1977 Value	Growth Rate
Illinois Population	9,668,000	11,249,000	16.4%
Licensed Drivers	4,586,000	6,742,000	47.0%
Registered Vehicles	3,513,000	6,838,000	94.6%
Fuel Consumption	2,749,000,000	5,587,000,000	103.2%
Motor Vehicle Registration (MVR) Revenue	$90,500,000	$338,900,000	274.5%
Motor Fuel Tax (MFT) Revenue	$146,400,000	$427,000,000	191.7%
Annual Vehicle Miles of Travel (VMT)	34,500,000,000	66,900,000,000	93.8%

An eclectic approach has been taken to the projection of revenue. As various predictor variables themselves are forecasted, the most appropriate technique for each variable was selected. Various methods were used including simple regression, econometric type models, and an accounting model.

The series of projections builds from one variable to the next in a logical straightforward progression. The assumptions and methods employed at each step are based on a review of relevant literature and professional judgment. However, the procedure may be modified at any step by adopting an alternate set of assumptions. The variations caused by new assumptions can be traced through each subsequent step of the process to the final revenue outcome based on the new assumptions.

In order for the Department to operate effectively in the future, it is necessary to make long-range estimates concerning energy consumption and other factors affecting revenues. Forecasts represent one way to pattern this future. Combining scientific methods, past experience, and professional judgment, a forecast attempts to relate relevant demographic, economic, and social factors to the forecasts at hand. Because each forecast involves a unique set of assumptions and assignment of different values or weights to variables, each forecast is a one-of-a-kind interpretive projection of future conditions. As pointed out previously, however, the building-block approach lends itself to analysis of alternative assumptions. Bear in mind that this forecast is not a reflection of what will happen. Rather, it projects what is probable given current policies, foreseen conditions, and the assumptions used.

An important issue which this analysis must address is the accuracy, or confidence limits, of the results. Naturally, the longer the range of the forecast, the less the confidence that accompanies the projections. This is because the error caused by inaccurate assumptions is compounded, unanticipated new factors impact on the relationships, and trends or stable relationships may change over time. Since most of the things affecting highway user characteristics and revenues in 1980 have already happened or are known, the forecasts for that year are reasonably precise. Again, for 1985, one can place a reasonable amount of confidence on the projected revenues.

Since this model builds from step-to-step, and a variety of methods are employed, pure and accurate statistical confidence limits cannot be calculated. From a practical standpoint, one must bear in mind that the projections are based on assumptions. Although these assumptions appear reasonable today, undoubtedly some degree of adjustment will be needed in the future. Charts 7 and 8 show approximations of confidence limits for MFT and MVR revenue projections.

In order to give the reader a sense of the sensitivity of this model, an example is offered which shows the effects of changing one assumption. It was assumed that past 1985, there will be an increase in automobile efficiency of 1 MPG per model year. If this assumption is changed to 1/2 MPG per model year, fuel consumption will be increased. The following table demonstrates the sensitivity of the model to this type of change in assumptions.

	1 MPG Increase		1/2 MPG Increase	
	MPG	Gross $	MPG	Gross $
1990	25.3	389.0	24.4	396.2
1995	30.4	373.8	27.4	392.6
2000	35.4	368.5	30.0	397.7

Modification of this one assumption results in a 7.9% or $29.2 million increase in projected motor fuel tax revenue for the year 2000.

- Assumptions -

Before proceeding to the individual building-block elements of our projections, our major assumptions are outlined:

1 - Fuel purchased in Illinois is consumed in Illinois, as well as the converse.

2 - No radical change in the relative cost of travel (elasticities constant).

3 - No fuel crisis (Note that although we do not include a crisis within our forecast period, the effects of a fuel shortage are well-documented and could be calculated from available data).

4 - Specifications of forecasts are correct or acceptable:

   A. Licensed drivers based on past trend and Illinois Bureau of the Budget (IBOB) population projections.

B. VMT based on licensed drivers, registered vehicles, and lagged VMT (VMT_{T-1}).

C. Vehicles registered based on past trend and licensed drivers.

5 - Illinois specific passenger car scrappage curve is correct.

6 - MPG's from Department of Energy (DOE), as well as those derived in house beyond 1985 are correct. From 1985 on, MPG estimates are increased by 1 MPG per year for passenger cars.

7 - FHWA projections of sub-compacts as a % of total passenger car registrations converts to Illinois' less than or equal to 35 Horsepower (HP) plates and is accurate.

8 - Vintage (model) year MPG is constant through life of vintage fleet.

9 - MFT and MVR rates remain at present levels.

10 - Electric cars have no impact throughout the forecast period.

11 - Historic Illinois estimates of total VMT are correct.

A summary of all the major forecasted variables is shown on the following page. Data for 1977 is included for comparative purposes. Charts representing some of the major variables are shown on pages 6 through 8. Charts 1 and 2 on page 6 show the relationships among Population, Licensed Drivers and Registered Vehicles, and Motor Vehicle Categories. Charts 3 and 4 on page 7 show Fuel Consumption and Highway Travel, and MFT Revenue Distribution. Charts 5 and 6 on page 8 show MVR Revenue Distribution and Net User Revenue Deposited in Road Fund. Charts 7 and 8 on page 9 show gross MFT and MVR with respective confidence limits.

SUMMARY OF UNITS

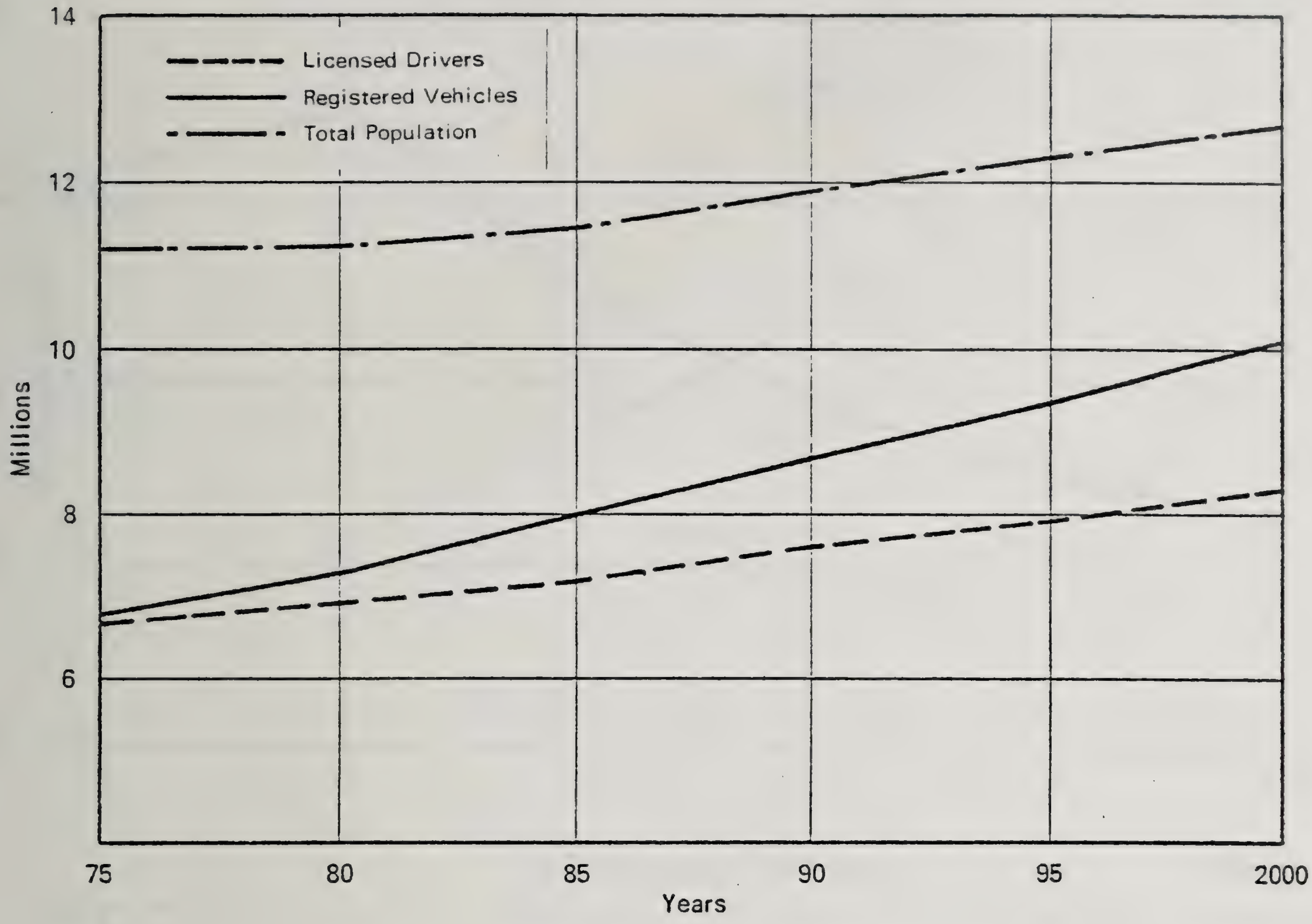
		Forecast Year				
Variable	1977	1980	1985	1990	1995	2000
Licensed Drivers	6,742,000	6,889,000	7,216,000	7,555,000	7,935,000	8,324,000
Registered Vehicles	6,838,028	7,259,000	7,970,000	8,681,000	9,401,000	10,123,000
Passenger Cars						
≤35 H.P.	1,432,464	1,532,000	2,635,000	3,921,000	5,032,000	5,841,000
>35 H.P.	4,279,336	4,529,000	4,020,000	3,327,000	2,818,000	2,612,000
Subtotal	5,711,800	6,061,000	6,655,000	7,248,000	7,850,000	8,453,000
A-B Trucks	722,962	770,000	845,000	920,000	997,000	1,073,000
RV Trucks	141,287	152,000	167,000	182,000	197,000	213,000
Other Trucks	261,979	276,000	303,000	331,000	357,000	384,000
Annual Vehicle Miles of Travel (In Millions)	66,947	71,200	77,400	83,900	90,200	96,900
Gallons Consumed on Highways (Millions)	5,587	5,755	5,259	4,947	4,730	4,647
Fleet MPG	11.98	12.37	14.72	16.96	19.07	20.85

SUMMARY OF REVENUES
(Millions of Dollars)

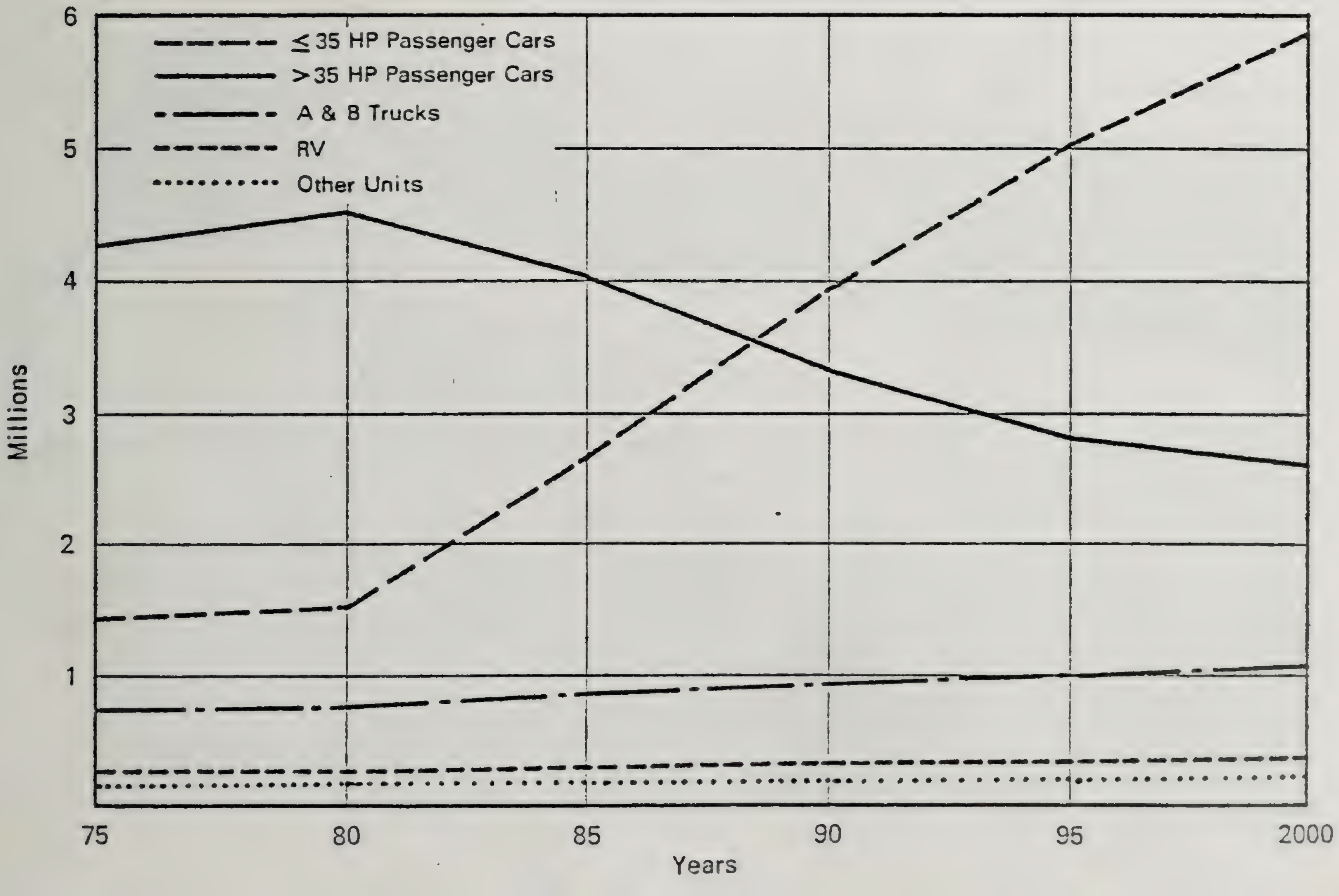
		Forecast Year				
Source/Distribution	1977	1980	1985	1990	1995	2000
Gross MFT	427.0	447.6	411.4	389.0	373.8	368.5
Road Fund	156.3	160.3	145.0	134.9	127.3	123.4
Miscellaneous	27.3	31.9	35.0	38.9	43.5	49.0
Local Agencies						
Counties	85.2	89.4	81.0	75.3	71.1	68.6
Townships	38.7	40.6	36.8	34.2	32.3	31.2
Municipalities	119.5	125.4	113.6	105.7	99.6	96.3
Total Local	243.4	255.4	231.4	215.2	203.0	196.1
Gross MVR	338.9	374.8	405.8	435.6	467.1	502.6
Road Fund	308.7	334.9	364.6	392.5	422.1	455.6
Miscellaneous	30.2	39.9	41.2	43.1	45.0	47.0
NET ROAD FUND	465.0	495.2	509.6	527.4	549.4	579.0

Note: All data represent calendar year.

POPULATION, LICENSED DRIVERS AND REGISTERED VEHICLES Chart 1

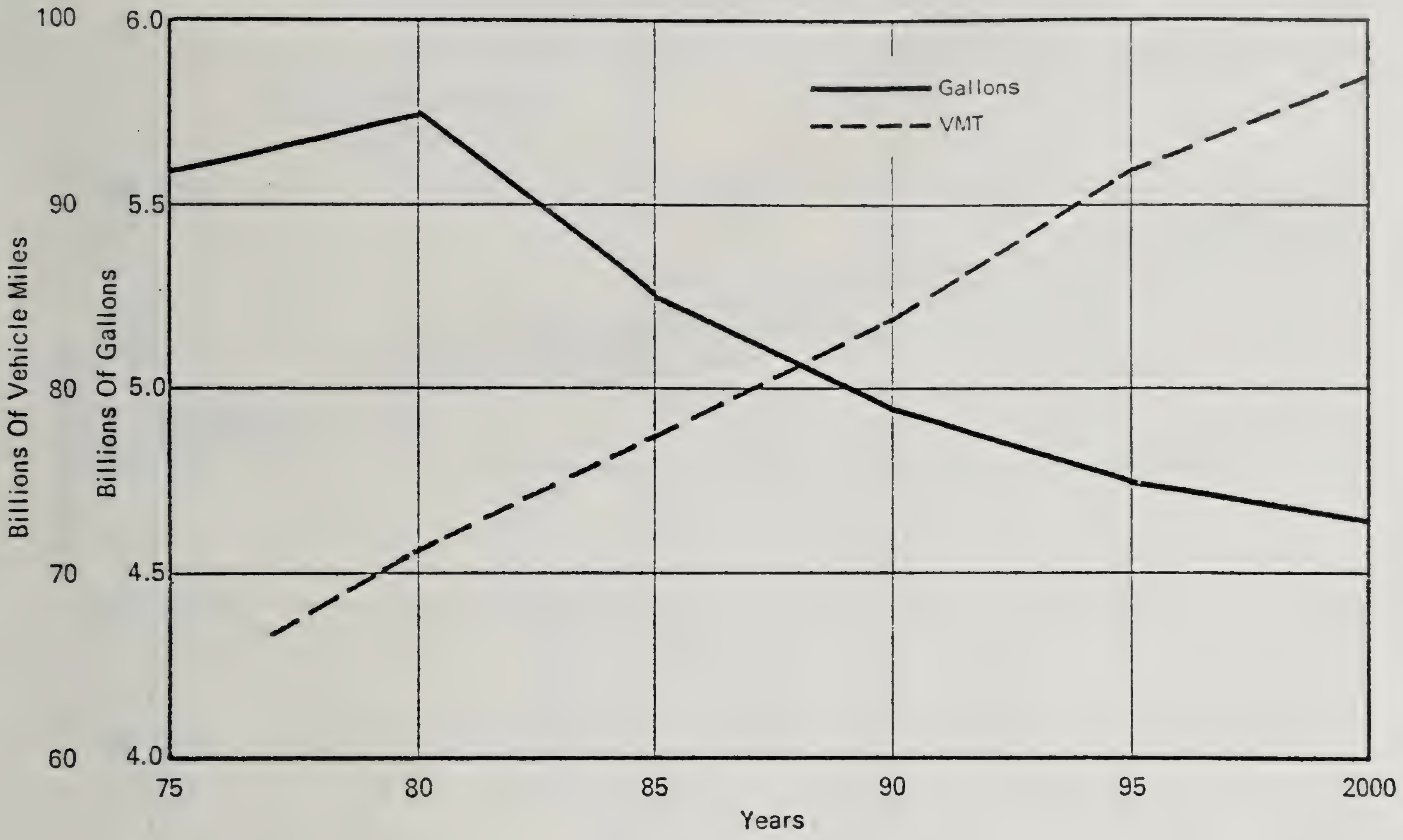


MOTOR VEHICLE CATEGORIES Chart 2



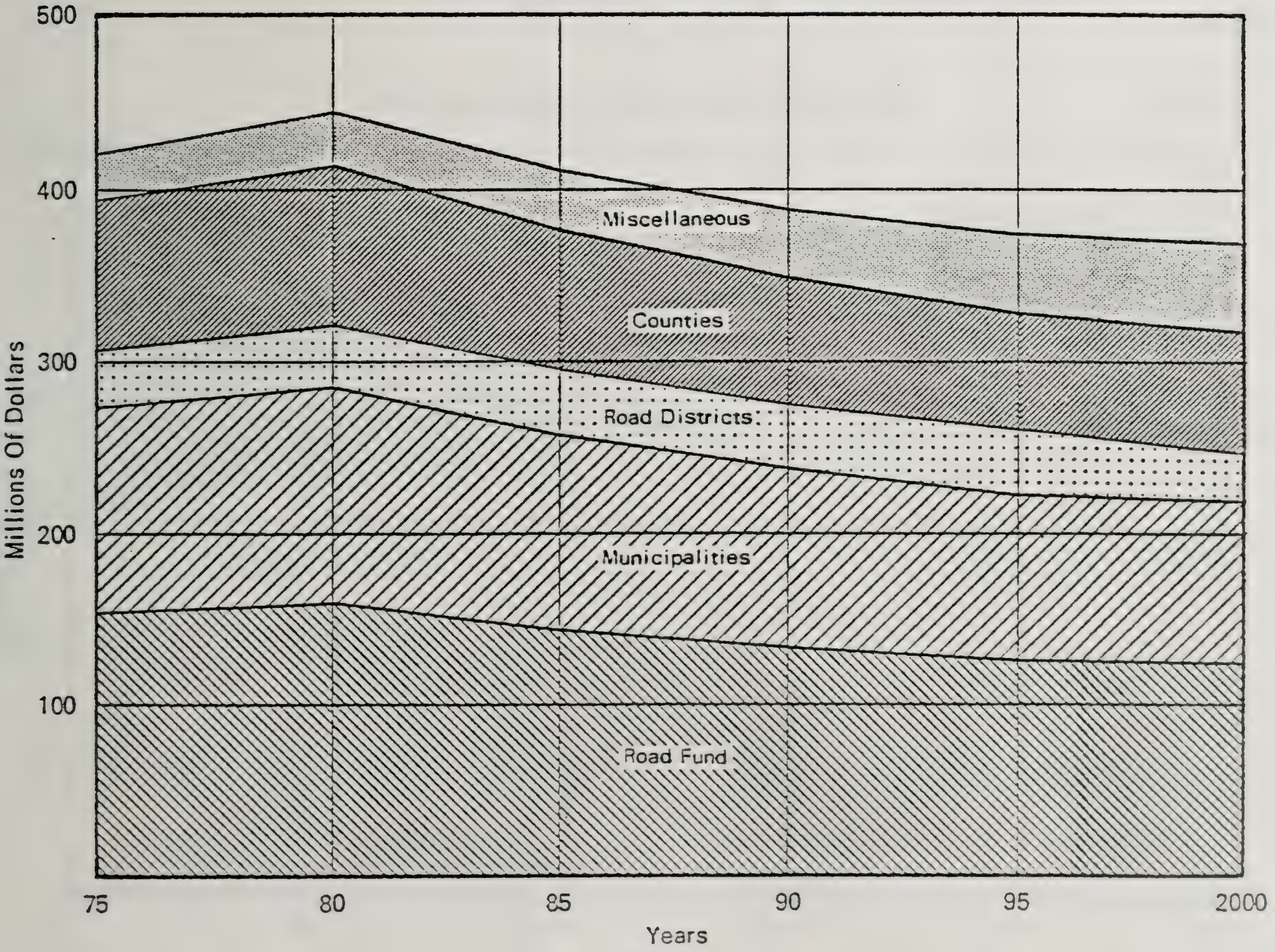
FUEL CONSUMPTION AND HIGHWAY TRAVEL

Chart 3

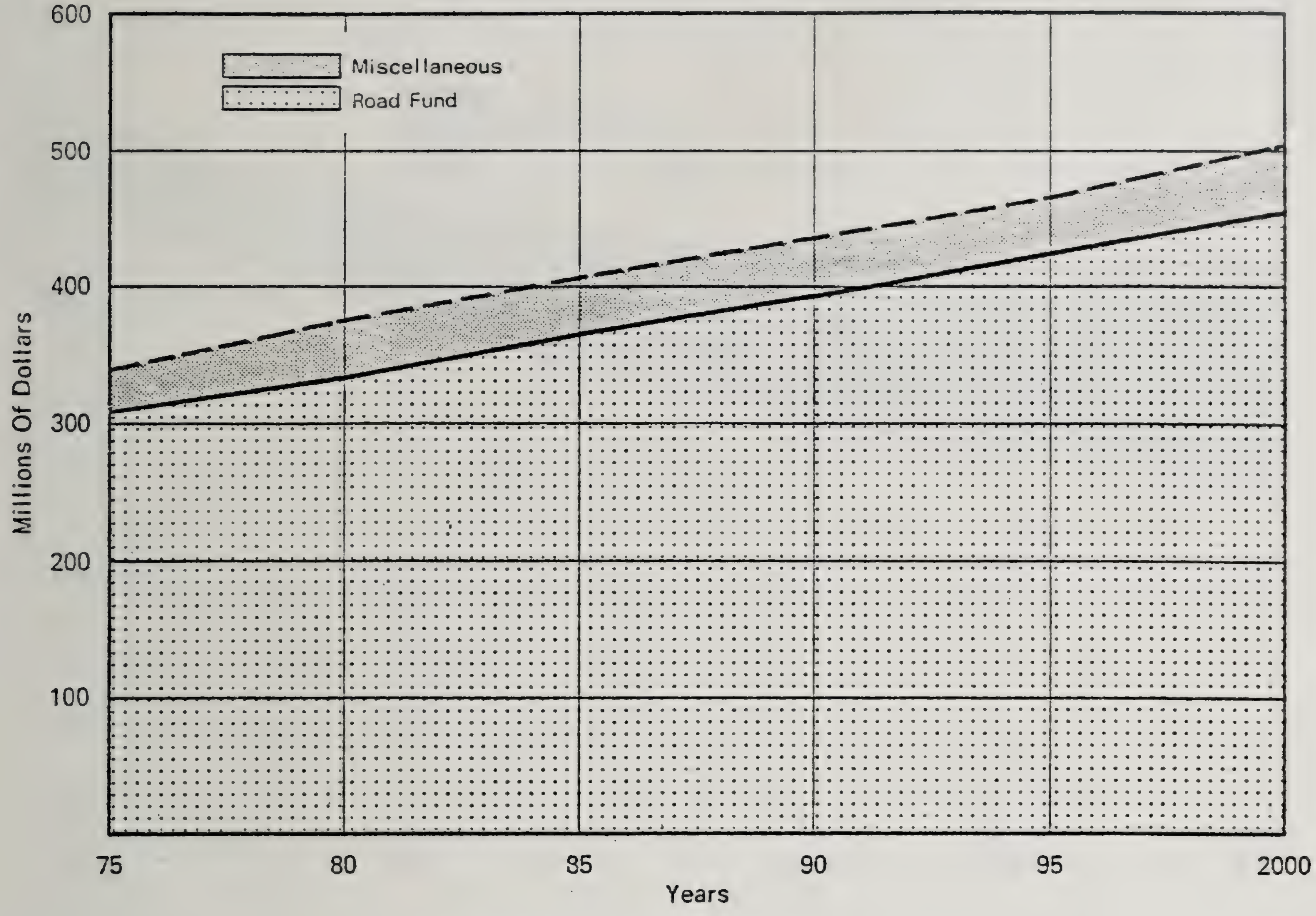


MFT REVENUE DISTRIBUTION

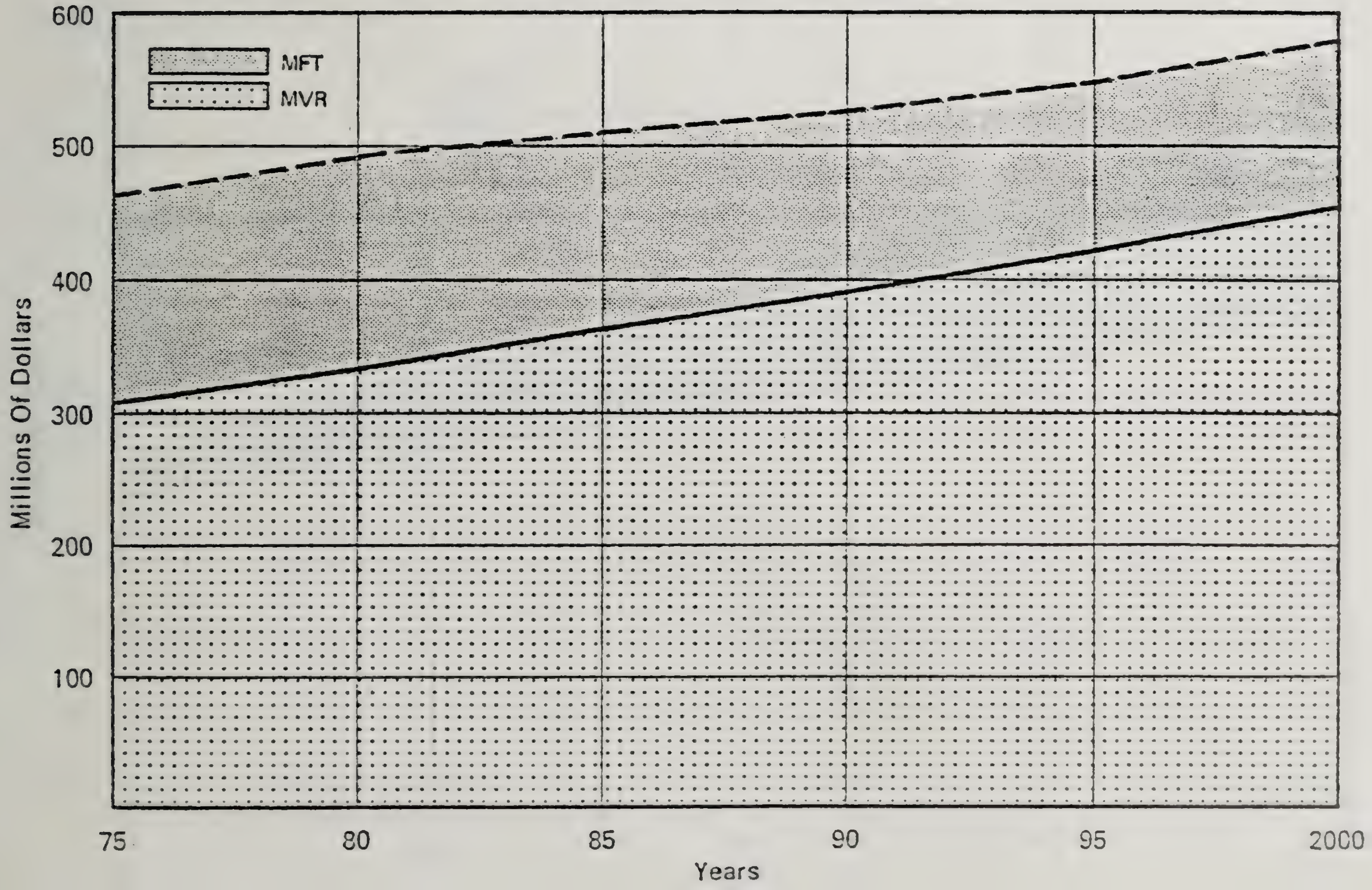
Chart 4



MVR REVENUE DISTRIBUTION Chart 5

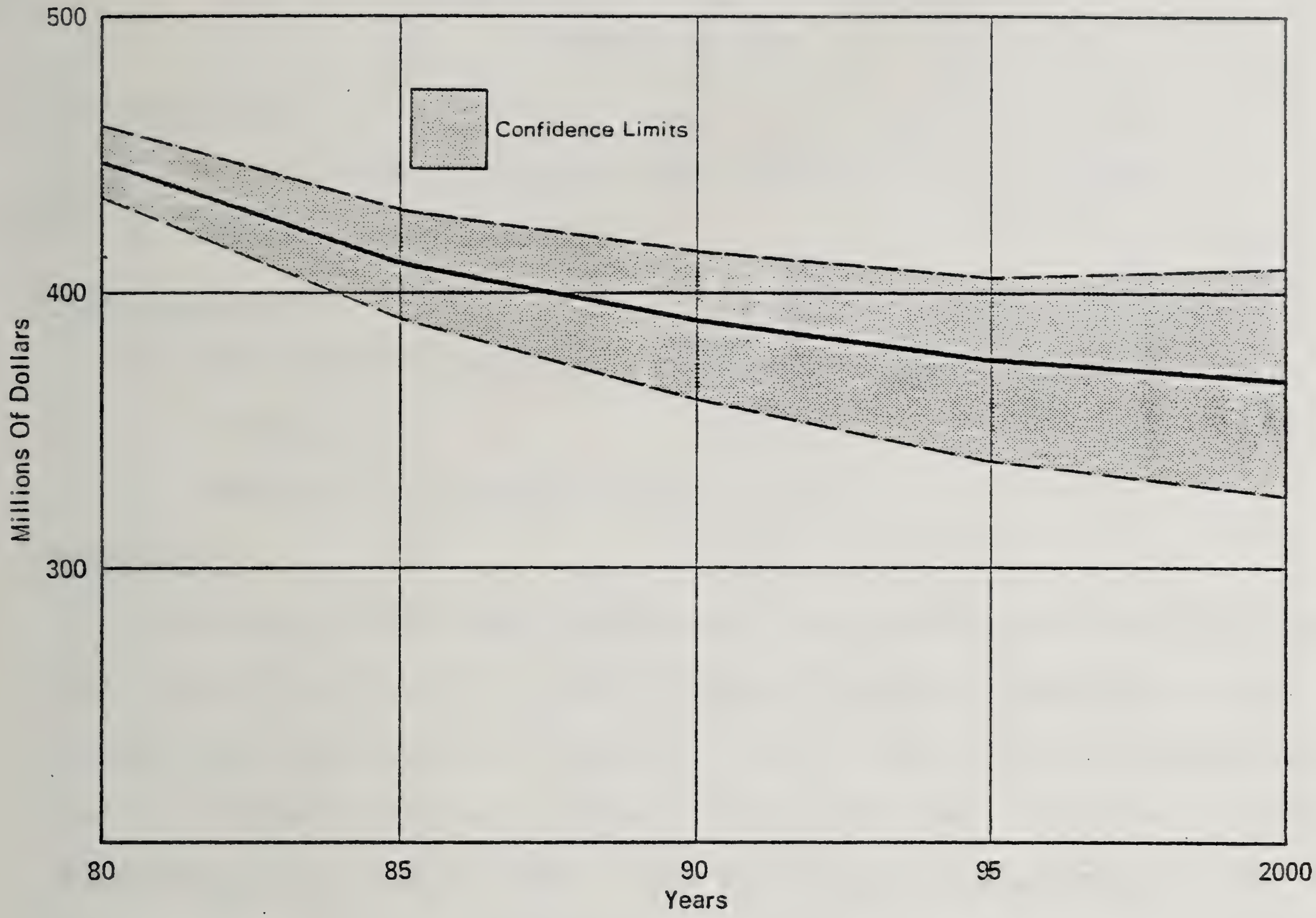


NET USER REVENUE DEPOSITED IN ROAD FUND Chart 6



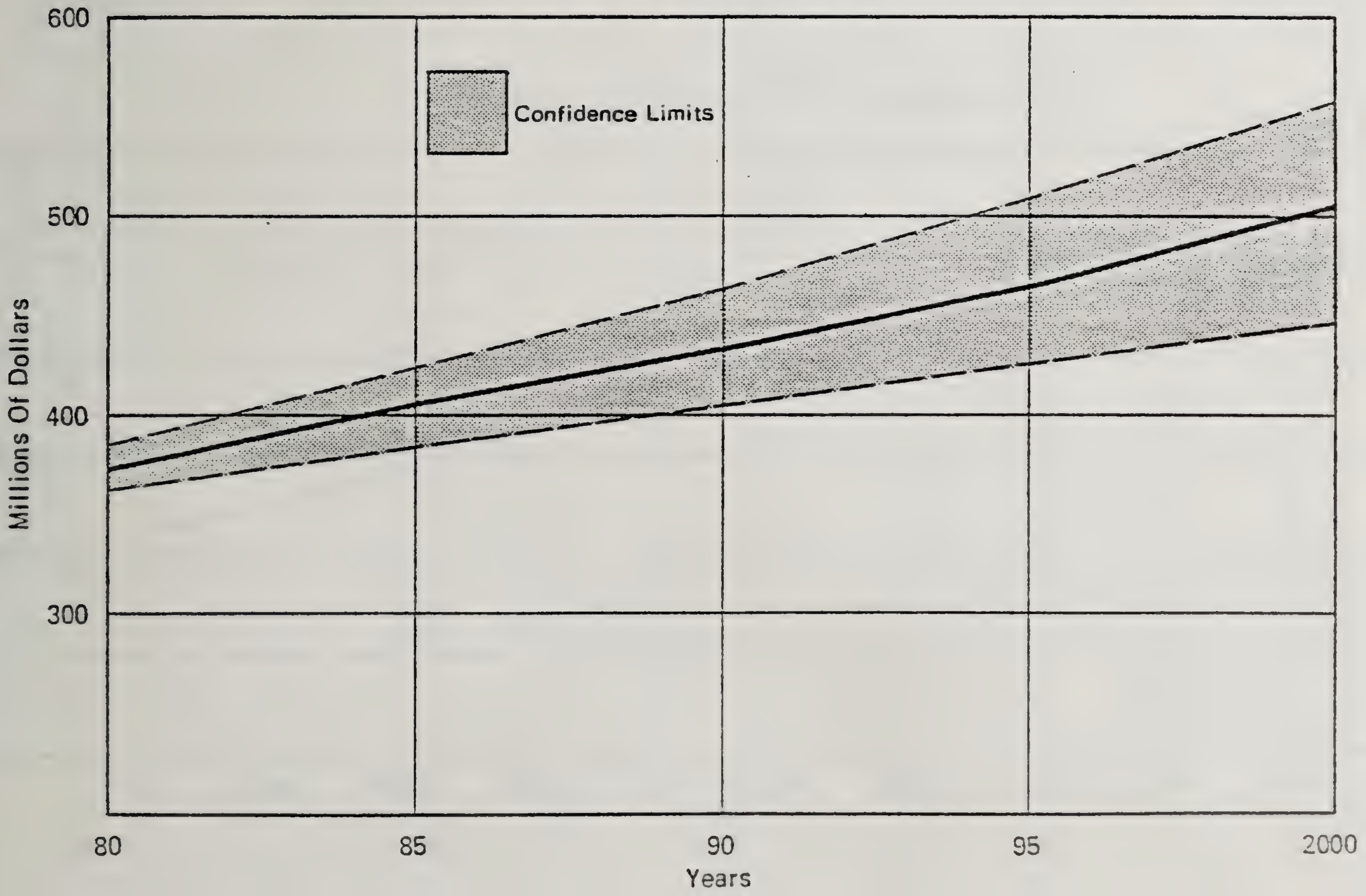
MFT REVENUE CONFIDENCE LIMITS

Chart 7



MVR REVENUE CONFIDENCE LIMITS

Chart 8



LICENSED DRIVERS

Variables used:

1. Historic data on licensed drivers as a % of population 15-74.
2. IBOB population projections.

Major assumptions:

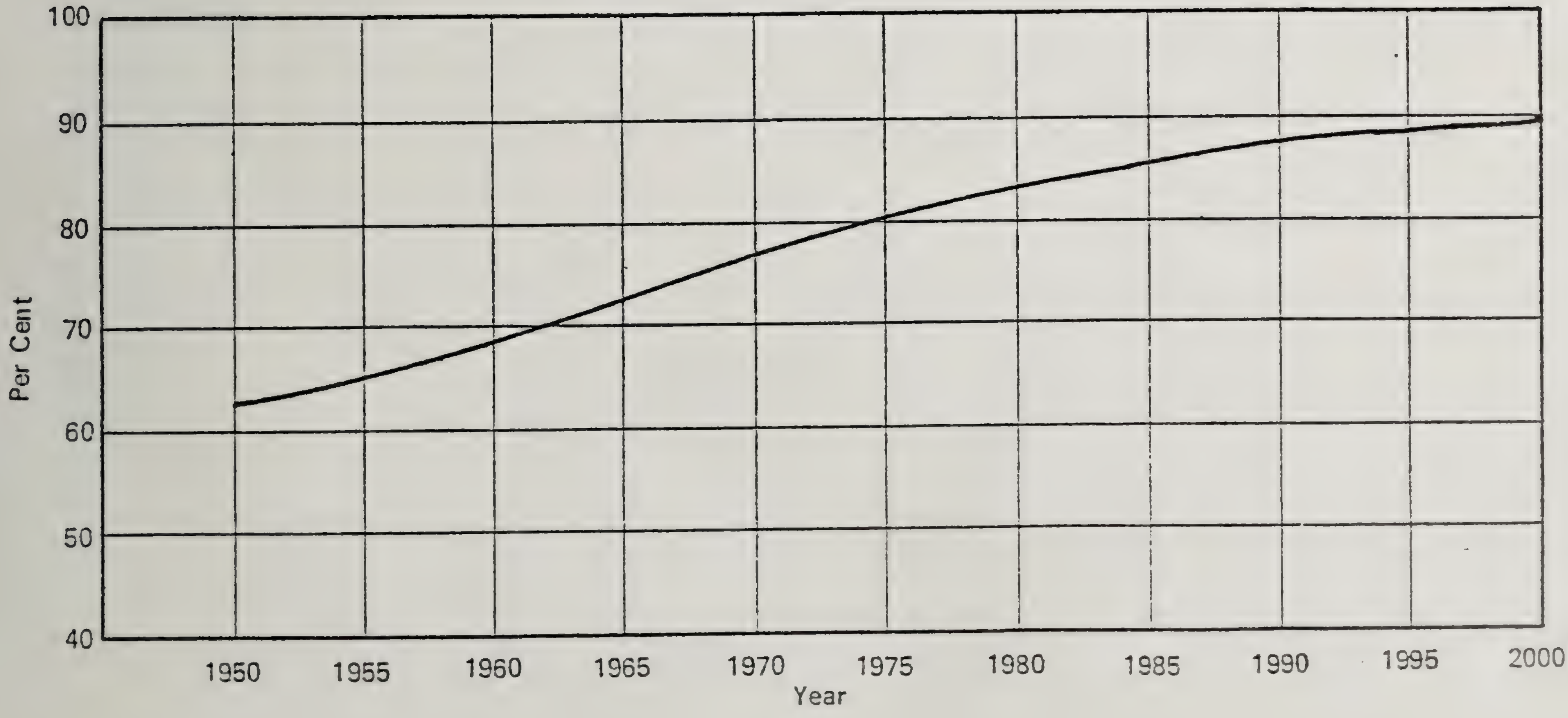
1. Saturation point of 90% of population 15-74 being licensed drivers is correct.
2. IBOB population projections are correct.

Methodology:

In the past, an increasing percentage of the population age group 15-74 has been licensed to drive. This is due to improving economic conditions and increased female participation in the labor force. These historic percentages were used in a regression program to achieve the best fit line. This curve yields projected percentages from 1980-2000. These percentages are then multiplied by IBOB projections of population age groups 15-74 to give forecasts of licensed drivers.

PER CENT OF POPULATION 15–74 LICENSED

Chart 9



POPULATION AND LICENSED DRIVERS

Year	Population age Group 15-74	% of Population 15-74 Licensed	Licensed Drivers
1950	6,407,000	62.3	3,995,000
1960	6,760,000	67.5	4,565,000
1970	7,547,000	76.2	5,752,000
1975	7,862,000	81.3	6,390,000
1980	8,310,000	82.9	6,889,000
1985	8,494,000	85.0	7,216,000
1990	8,704,000	86.8	7,555,000
1995	8,970,000	88.5	7,935,000
2000	9,249,000	90.0	8,324,000

Licensed Drivers:

1980-2000 shows a 20.8% increase.

1957-1977 shows a 47.0% increase.

REGISTERED VEHICLES

Variables used:

1. Past trend of vehicles registered.
2. Licensed drivers.

Assumptions:

1. Socio-economic factors affecting historic growth rate of registered vehicles will be relatively stable in the future and the number of vehicles registered will continue to have a close relationship to the number of licensed drivers.
2. Projected vehicles registered acts as a control total for passenger cars, A and B trucks, recreational vehicles (R-V's) and other units, which are disaggregated later in this paper.

Methodology:

The number of vehicles registered was regressed on licensed drivers and time trend of vehicles registered. Registered vehicles are easily related conceptually to licensed drivers. However, when a regression was run on this variable alone, the forecast appeared too low. As a result, the time variable was included. With both independent variables in the equation*, the number of vehicles registered for 1977 was below the observed value. In order to correct this under-estimation, 365,000 was added to the results of the regression as a constant for all forecast years. The resulting estimates of vehicles registered are shown below:

Year	Vehicles Registered
1980	7,259,000
1985	7,970,000
1990	8,681,000
1995	9,401,000
2000	10,123,000

Registered Vehicles:

1980-2000 shows a 39.5% increase
1957-1977 shows a 94.6% increase

*See Appendix A for formula.

DISAGGREGATION OF TOTAL REGISTERED VEHICLES

1. Passenger Cars
2. A-B Trucks - A trucks have gross weights of 3,000 lbs. or less; B plate trucks are 3,001-8,000 lbs. gross weights.
3. Recreational vehicles.
4. Other motor driven units. This category includes all flag weight trucks greater than 8,000 lbs. gross weight, farm trucks, government trucks and other miscellaneous type trucks.

Variables used:

Total vehicles registered. 1977 distribution of passenger cars, A-B trucks, R-V's other units.

Assumptions:

1. The forecasts of total vehicles registered are accurate.
2. The proportion of each category will remain constant at 1977 levels.

Disaggregation Methodology:

The total number of vehicles registered for each forecast period was forecasted in the previous step. These totals were disaggregated by applying the 1977 observed proportions registered in each category.

MOTOR VEHICLE FLEET CATEGORIES

	1977	%	1980	1985	1990	1995	2000
assenger Cars	5,711,800	83.5	6,061,000	6,655,000	7,248,000	7,850,000	8,453,000
A-B Trucks	722,962	10.6	770,000	845,000	920,000	997,000	1,073,000
-V's	141,287	2.1	152,000	167,000	182,000	197,000	213,000
ther Units	261,979	3.8	276,000	303,000	331,000	357,000	384,000
otal Vehicles Registered	6,838,028	100.0	7,259,000	7,970,000	8,681,000	9,401,000	10,123,000

SUB-CATEGORIES OF PASSENGER CARS AND LIGHT TRUCKS

Variables used:

1. Forecasts of passenger car and A-B truck registrations.

Assumptions:

1. Above forecasts are correct.
2. FHWA forecast of sub-compacts as a % of total passenger car registrations are correct.

Methodology:

In "Highway Travel Forecasts" cited earlier, a table, "Estimated Distribution of Automobile Registrations by Vehicle Size," is presented on Page 34. The category economy (sub-compact) approximates the Illinois Passenger registration category less than 35 HP. The table presents estimates through 1990. Values were extrapolated for 1995 and 2000. These percentages were then applied to total passenger car registrations as shown below.

Year	% Sub-Compacts	Total Passenger Car Registrations	Registrations ≤35 HP
1980	25.27*	6,061,000	1,532,000
1985	39.6	6,655,000	2,635,000
1990	54.1	7,248,000	3,921,000
1995	64.1	7,850,000	5,032,000
2000	69.1	8,453,000	5,841,000

The >35 HP registrations are derived by subtracting the ≤35 HP registrations from total passenger car registrations.

*The 1980 percentage as published was 25.1. Since 25.27% of Illinois' passenger cars were in the ≤35 HP class in 1977, this value is considered a minimum.

Year	Total Passenger Car Registrations	≤35 HP Registrations	>35 HP Registrations
1980	6,061,000	1,532,000	4,529,000
1985	6,655,000	2,635,000	4,020,000
1990	7,248,000	3,921,000	3,327,000
1995	7,850,000	5,032,000	2,818,000
2000	8,453,000	5,841,000	2,612,000

In 1977,"A"truck registrations were 1.09% of total "A" and "B" registrations. "A"truck registrations were assumed to increase at the same rate as ≤35 HP cars.

Year	Total A-B Trucks	A Trucks	B Trucks
1980	770,000	8,366	761,634
1985	845,000	14,389	830,611
1990	920,000	21,411	898,589
1995	997,000	27,478	969,522
2000	1,073,000	31,896	1,041,104

VEHICLE MILES OF TRAVEL (VMT)

Variables used:

1. Licensed Drivers
2. Vehicles registered
3. Lagged VMT

Assumptions:

1. Past estimates of total annual VMT are correct.
2. Licensed drivers, registered vehicles, and VMT lagged one year are adequate predictors of future VMT.
3. VMT will not be seriously affected by exogenous factors. That is, we assume no future fuel crises. However, if a fuel crisis occurred, its effects could be calculated based on past data.
4. No tremendous change in the relative cost of travel including fuel price and new car price.
5. A pattern of economic growth roughly similar to past trends will continue.

Methodology:

Forecasts of VMT are based on a regression on licensed drivers, vehicles registered, and VMT lagged one year. The first two variables are easily related substantively to VMT. An increase in either the number of drivers or vehicles should lead logically to an increase in travel. VMT lagged one year is simply the VMT in the previous year. A lagged variable theoretically accounts for all factors or variables not included (vehicles and drivers) but which have a systematic effect on the dependent variable (VMT).

Several other methods of forecasting VMT were also used, including regressing VMT on the three independent variables individually, curve fits and forecasts

based on miles per driver and miles per vehicle. The first method, discussed above, was chosen as the best for two reasons. First, the variables used made intuitive sense. Second, the forecast results were in the middle range compared to forecasts from the other models.

The model* resulted in the following forecasts:

Year	VMT (Millions)
1980	71,200
1985	77,400
1990	83,900
1995	90,200
2000	96,900

VMT:

1980-2000 growth shows a 36.0% increase.

1957-1977 growth shows a 93.8% increase.

*For equation, see Appendix A.

MOTOR FUEL CONSUMPTION

Variables used:

1. VMT forecasts
2. Passenger car, A-B trucks, and other unit vehicle registrations
3. Illinois specific scrappage curve
4. Annual miles per vehicle rates
5. Vintage and annual MPG data.

Assumptions:

1. Illinois specific scrappage curve is accurate.
2. Miles driven per passenger car by age of car are correct.
3. MPG by vintage year for passenger cars is correct.
4. Passenger cars, RV's and A-B trucks travel 9,000 per year.
5. A-B truck MPG is correct.
6. Other unit MPG is correct.
7. Projections of VMT, passenger car, A-B truck, and other unit registrations are correct.
8. Model year MPG's constant through life of vehicle.

Sources:

1. Miles driven per passenger car by age of unit is taken from: "Cost of Operating an Automobile" by L. L. Liston and C. A. Aiken, 1976, U.S. Department of Transportation.
2. MPG by vintage year for passenger cars from: "Light Duty Vehicle Fuel Consumption Model 1975-1986" by Energy and Environmental Analysis, Inc. prepared for U.S. Department of Energy, April 28, 1978. Also, conversations with Barry McNutt, U.S. Department of Energy, September 1978.

3. MPG by fleet year of A-B trucks from conversations with Barry McNutt, U.S. DOE, September 1978.

Methodology:

It is in this analysis that all preceding data is synthesized into projections of fuel consumption. Various methods are employed in a relatively straightforward step-by-step procedure. Assumptions may be altered at any point and new assumptions "plugged in" to test their effect on consumption.

Step 1 -

Estimate passenger car registrations for forecast years by vintage year.

The first step is the estimation, of how many 1964, 1965, 1966,. . .1980 vintage automobiles are registered in 1980. The Illinois Specific Automobile Scrappage model is used for this purpose. New car sales are projected based on the trend of past sales. The next problem is to determine the attrition or scrappage rate of cars. A scrappage curve was developed based on an analysis of historical passenger car registration data. The curve shows the percentage of a vintage year still registered in succeeding years.

ILLINOIS SPECIFIC SCRAPPAGE CURVE

Chart 10

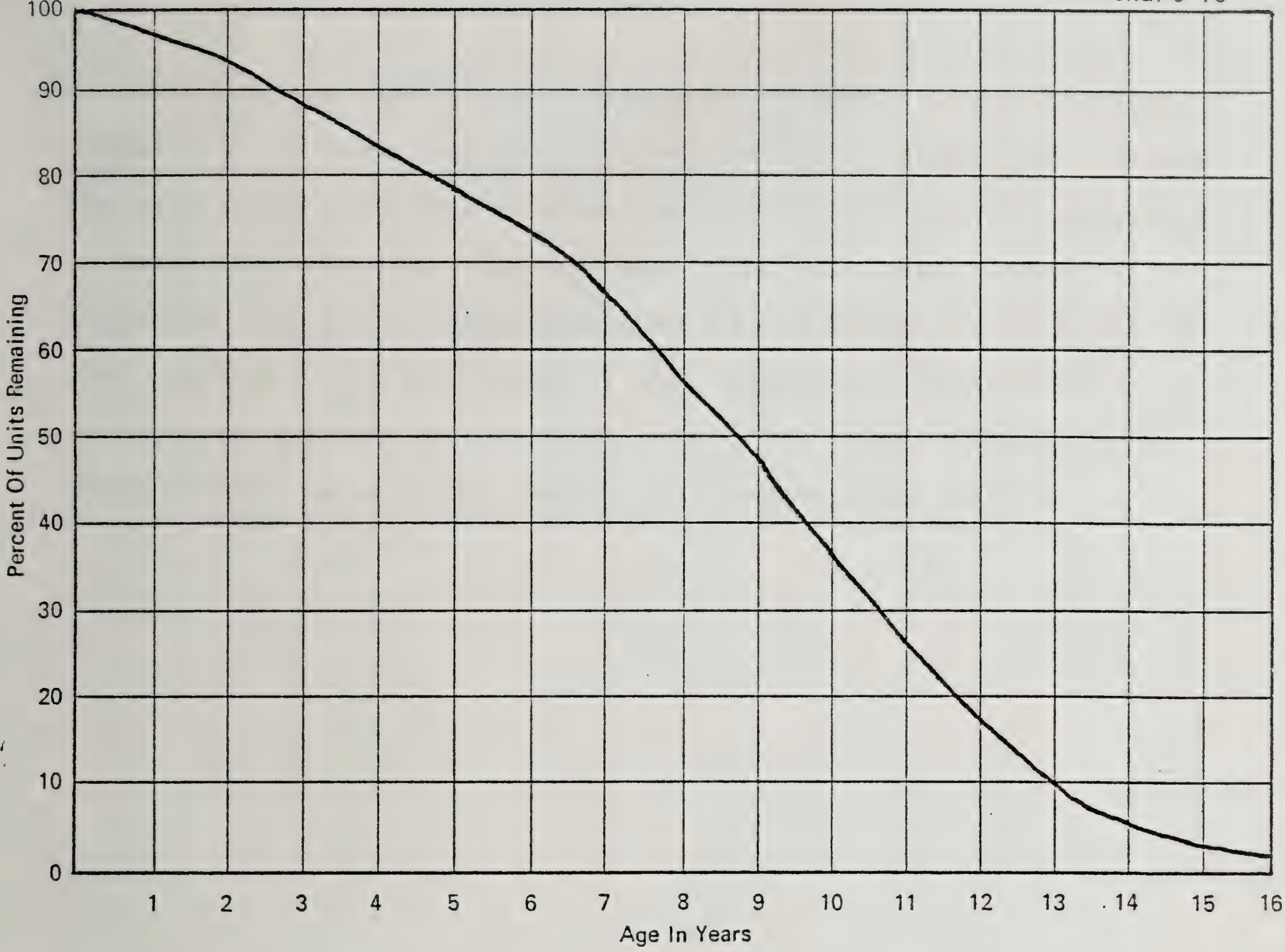


Fig. 2

This curve is then used to "survive" new registrations over the life of the vintage (model) year. For example, new car sales registrations for vintage year 1977 in Calendar Year 1977 equals 729,474. In 1978, 96.75% of the 1977 cars remain, 705,766. In the third year for 1977 vintage, 93.92%, or 685,122 remain in Calendar Year 1979, and so on.

The resulting distributions of vintage year by model year provide reasonable estimates of the proportions of vintage registrations by calendar year. However, the total is too high. This is because car sales are anticipated to increase at a slower rate in the future than they have in the recent past. In order to adjust for this, the calculated proportions are used but are applied to the control totals derived in our forecast of total passenger car registrations by calendar year discussed earlier in this paper. This procedure results in the distribution of passenger cars used for the remainder of the analysis.

Step 2 -

Integrate vintage automobile registrations with travel by age of automobile and MPG data to estimate automobile fuel consumption.

Miles travelled annually by age of vehicle is a crucial element of this analysis. Both U.S. DOT and U.S. DOE have published material in this area. (See sources listed earlier in this section). Our Illinois model used in this analysis lies in the mid-range between the two Federal studies. The FHWA study assumes a car life of ten years and total mileage of 100,000. DOE assumes a total life span of twenty years and 169,000 miles. The Illinois model is sixteen years and 137,000 miles. The miles driven by age of automobile is given in Column 3 of Table 1. This data is from Liston and Aiken, "Cost of Operating an Automobile." When this column is multiplied by the number of units in Column 2, the result is an estimate of VMT by model year.

The next calculation translates these model year specific VMT's to gallons consumed. Model year specific MPG's from DOE are found in Column 5. By dividing these numbers into Column 4, fuel consumption by model year is obtained. The sum of Column 6 is the total fuel consumed by passenger cars for the calendar year. By dividing this resultant total into the total of Column 4, a weighted-fleet calendar year MPG average can be determined (line 19). Note that Column 3, miles per year/unit, is used solely to calculate a weighted average MPG by calendar year. It is not an indication of accurate passenger car travel.

AVERAGE MILES PER GALLON FOR PASSENGER CAR FLEET REGISTERED IN 1977

(1) Model Year	(2) Number of Units	(3) Miles per Year/Unit	(4) VMT (2)x(3)	(5) MPG	(6) Gallons Consumed
1961	7,423	5,000	37,115,000	15.0	2,474,333
1962	14,959	5,100	76,290,900	14.9	5,120,195
1963	29,482	5,200	153,306,400	14.9	10,289,020
1964	54,977	5,300	291,378,100	15.0	19,425,207
1965	114,238	5,400	616,885,200	15.1	40,853,325
1966	160,579	5,500	883,184,500	14.9	59,274,128
1967	213,568	5,600	1,195,980,800	14.8	80,809,514
1968	304,099	5,700	1,733,364,300	14.6	118,723,582
1969	334,936	7,500	2,512,020,000	14.6	172,056,164
1970	376,178	8,500	3,197,504,500	14.8	216,047,601
1971	484,140	9,500	4,599,330,000	14.3	321,631,469
1972	567,938	9,900	5,622,586,200	14.1	398,764,979
1973	629,446	9,900	6,231,505,500	13.9	448,309,748
1974	528,237	10,000	5,282,370,000	13.6	388,409,559
1975	506,404	11,500	5,823,646,000	14.3	407,247,972
1976	655,722	13,000	8,524,386,000	15.4	553,531,558
1977	729,474	14,500	10,577,373,000	16.1	656,979,689
	5,711,800	10,042	57,358,226,400	14.707	3,899,948,043

(By dividing the total of Column 4 (Passenger Car VMT) by the projected total VMT, we get 85.67%. In "Highway Travel Forecasts" 1974, U.S. DOT, a comparable national percentage is given (pp. 12-13). "The passenger car total. . .of total highway travel remained relatively constant, with minor fluctuations, at about 80% throughout the 1950-1972 period.")

This is a strong indication that the FHWA estimates of miles travelled per unit by age of unit are inappropriate for Illinois.

For comparative purposes, data are presented for other states. Estimates of passenger car VMT were obtained by taking 80% of total VMT reported in Highway Statistics Summary to 1975. This VMT was then divided by passenger cars registered, which yields annual miles travelled per passenger car.

State	Passenger Car VMT (Millions)	Passenger Cars Registered	Annual Miles per Unit
California	106,080	11,226,000	9,449
New York	52,099	6,735,000	7,736
Ohio	51,307	6,288,000	8,160
Texas	67,666	6,217,464	10,883

The number of vehicles registered has exceeded the number of licensed drivers in Illinois since 1976. Chicago has a public transit system which curtails passenger car travel. In light of these facts, and after comparing Illinois to the states in the above example, it was decided to use 9,000 annual miles per passenger car in the remainder of this analysis. In 1977, there were 5,711,800 passenger cars registered. At 9,000 miles each, this results in 51,406 million passenger vehicle miles of travel. Total annual vehicle miles of travel was 66,947 million. Passenger car travel accounted for 76.8% which is reasonable.

The calculation of fuel consumption for 1980 is shown below for illustrative purposes. There are five elements in this analysis: Number of units, annual miles per unit, VMT, M.P.G. and gallons consumed. The method of projecting registrations was shown earlier in the paper. Miles per vehicle for passenger cars, A-B trucks, and R-V's was assumed to be 9,000. VMT for these three categories was the product of unit and miles per unit. When the subtotal VMT for these three categories is subtracted from the total projected VMT, other unit VMT is the residual.

Miles per gallon for passenger cars was calculated through the method illustrated above. The Department of Energy furnished projected miles per gallon data for light duty trucks, comparable to Illinois' A-B plate trucks and R-V units. In-house analysis of data for other units indicated an M.P.G.

of 4.8. By dividing VMT for each category by respective MPG figures, fuel consumption is obtained. Data for 1980 are shown below.

1980

Category	Units	Miles/ Unit	VMT (Millions)	MPG	Gallons Fuel Consumed (Millions)
Passenger Cars	6,061,000	9,000	54,549	16.01	3,407
A-B Trucks	770,000	9,000	6,930	13.7	506
R-V	152,000	9,000	1,368	13.7	100
Other Units	276,000	30,388	8,387	4.8	1,742
Total	7,259,000		71,234		5,755

Year	VMT in Millions	Gallons Consumed in Millions	Fleet MPG
1977	66,947	5,587	11.98
1980	71,200	5,755	12.38
1985	77,400	5,259	14.72
1990	83,900	4,947	16.96
1995	90,200	4,730	19.07
2000	96,900	4,647	20.85

MOTOR FUEL TAX REVENUE AND DISTRIBUTION

Variable Used:

1. Consumption of motor fuel on highways.

Assumptions:

1. Forecast of highway usage is correct.
2. Refunds for 1980 was set at $16 million based on historical data and professional judgment.
3. Refunds for non-highway use of motor fuel would increase one million dollars every five years.
4. Motor fuel tax of 7½ cents per gallon remains constant through the forecast period.
5. Administrative costs for collection and distribution of the tax will increase 5% compounded annually using $7.9 million for 1980 as a base.
6. Current distribution formula will remain in effect through the forecast period.

Methodology:

Simple mathematics.

MOTOR FUEL TAX REVENUE AND DISTRIBUTION

(Dollars in Millions)

Category	Year 1980	1985	1990	1995	2000
Gross Revenue	447.6	411.4	389.0	373.8	368.5
Refunds for non-highway use	16.0	17.0	18.0	19.0	20.0
Administration	7.9	10.0	12.9	16.5	21.0
Grade Crossing Fund	6.0	6.0	6.0	6.0	6.0
Boating Act	2.0	2.0	2.0	2.0	2.0
Road Fund (net)	160.3	145.0	134.9	127.3	123.4
Local Agencies					
Counties	89.4	81.0	75.3	71.1	68.6
Townships	40.6	36.8	34.2	32.3	31.2
Municipalities	125.4	113.6	105.7	99.6	96.3
Total Local Agencies	255.4	231.4	215.2	203.0	196.1

MOTOR VEHICLE REGISTRATION REVENUE

Variables Used:

1. Forecasts for units of passenger cars, A and B trucks, other motor driven vehicles, and licensed drivers. Historical Data.

Assumptions:

1. Forecasts for above units are correct.
2. There will be no change in fee structure.

Methodology:

There are many types of vehicles and fees that comprise the total amount of revenue referred to as motor vehicle registration fees. Because of the large number of categories, each individual one was not forecasted. However, five major categories were selected and forecasts made. These five categories comprised approximately 80% of the total revenue in 1977.

The five major categories are:

1. Passenger cars.
2. A and B flat weight trucks.
3. Recreational vehicles
4. Other flat weight motor driven vehicles excluding motorcycles.
5. Driver Licenses.

Units for these categories were shown in previous sections of this report. There is a specific correlation between units and fees for passenger cars, A and B trucks, and recreational vehicles and driver license; therefore, calculation of these fees involve simple mathematics. The category, other motor driven vehicles, includes 30 sub-categories with fees varying from $5 per unit to $1,560 per unit.

Because of the complexities of this category, an average fee based on 1977 was applied to the forecasted figures.

The revenue received from other fees not covered in the above four categories represent many sub-categories with varying fees. Because of the level of detail involved, each sub-category was not forecasted individually. An analysis was made at a gross level of historical data from which estimates of change of units from 1972 to 1977 were derived and an average fee based on 1977 data was computed. The estimates of five-year changes and average fees were applied to 1977 base data to get future forecasts. Examples of the types of transactions included in this potpourri category are: License driver fees, title fees, dealer plate fees, reclassification fees and trailer fees.

MOTOR VEHICLE REGISTRATION UNITS

	Years				
Category	1980	1985	1990	1995	2000
Passenger Cars					
≤35	1,532,000	2,635,000	3,921,000	5,032,000	5,841,000
>35	4,529,000	4,020,000	3,327,000	2,818,000	2,612,000
Subtotal	6,061,000	6,655,000	7,248,000	7,850,000	8,453,000
A & B Truck	770,000	845,000	920,000	997,000	1,073,000
RV Trucks	152,000	167,000	182,000	197,000	213,000
Other Trucks	276,000	303,000	331,000	357,000	384,000
Trailers	630,000	733,000	836,000	939,000	1,042,000
Titles	3,658,000	3,907,000	4,252,000	4,611,000	4,973,000
Driver License	6,888,000	7,216,000	7,555,000	7,935,000	8,324,000
Other Miscellaneous	5,936,000	7,538,000	9,139,000	10,739,000	12,340,000

MOTOR VEHICLE REGISTRATION REVENUES

(Millions of Dollars)

Category	Year 1980	1985	1990	1995	2000
Revenue					
Passenger Cars					
≤35 HP	27.6	47.4	70.6	90.6	105.1
>35 HP	135.9	120.6	99.8	84.5	78.4
Subtotal	163.5	168.0	170.4	175.1	183.5
A & B Truck	23.1	25.2	27.5	29.7	32.0
RV's	2.8	3.1	3.3	3.6	3.9
Other Trucks	107.9	118.5	129.4	139.6	150.1
Trailers	9.2	10.7	12.2	13.7	15.2
Titles	11.0	11.7	12.8	13.8	14.9
Driver License	18.4	19.2	20.1	21.2	22.2
Other Miscellaneous	38.9	49.4	59.9	70.4	80.8
Total Revenue	374.8	405.8	435.6	467.1	502.6
Deductions					
RTA	16.0	16.0	16.0	16.0	16.0
General Revenue	11.0	11.7	12.8	13.8	14.9
Vehicle Recycling Fund	3.7	3.9	4.3	4.6	5.0
Driver Education Fund	9.2	9.6	10.0	10.6	11.1
NET Revenue to Road Fund	334.9	364.6	392.5	422.1	455.6

GROSS HIGHWAY USER REVENUE

(Millions of Dollars)

Year	MFT	MVR	TOTAL
1980	447.6	374.8	822.4
1985	411.4	405.8	817.2
1990	389.0	435.6	824.6
1995	373.8	467.1	840.9
2000	368.5	502.6	871.1

ROAD FUND REVENUE

(Millions of Dollars)

Year	MFT	MVR	TOTAL
1980	160.3	334.9	495.2
1985	145.0	364.6	509.6
1990	134.9	392.5	527.4
1995	127.3	422.1	549.4
2000	123.4	455.6	579.0

The net revenue from MFT and MVR fees is transferred to the Road Fund for transportation related activities including operations of several other state departments and agencies.

APPENDIX A: REGRESSION FORMULAS FOR MVR AND VMT

1. MVR

Regression of licensed drivers and registered vehicles over time is expressed by the formula:

$$\hat{Y} = 1547 + 129.165 \text{ (Year-1949)} + 0.195 \text{ (Licensed Drivers)}$$

For 1980, the forecast is:

$$\hat{Y} = 1547 + 129.165(31) + 0.195 \ (6,888,000) = 6,894,000$$

2. VMT

Regression of VMT lagged one year, licensed drivers and registered vehicles is expressed by the formula:

$$\hat{Y} = 2,590,880 + 0.716 \text{ (LVMT)} + 1.666 \text{ (Licensed Drivers)} + 1.742 \text{ (Registered Vehicles)}$$

LVMT = Lagged Vehicle Miles of Travel

For 1978, the forecast is:

$$\hat{Y} = -2,590,808 + 0.716 \ (66,947,000) + 1.666 \ (6,790,586) + 1.743 \ (6,982,000) = 68,826,000$$

APPENDIX B: MILES PER GALLON FOR PASSENGER CARS - MODEL YEARS 1961-2000

Model Year	MPG	Model Year	MPG
1961	15.0	1981	20.0
1962	14.9	1982	21.4
1963	14.9	1983	22.9
1964	15.0	1984	23.9
1965	15.1	1985	24.4
1966	14.9	1986	25.4
1967	14.8	1987	26.4
1968	14.6	1988	27.4
1969	14.6	1989	28.4
1970	14.8	1990	29.4
1971	14.3	1991	30.4
1972	14.1	1992	31.4
1973	13.9	1993	32.4
1974	13.6	1994	33.4
1975	14.3	1995	34.4
1976	15.4	1996	35.4
1977	16.1	1997	36.4
1978	17.0	1998	37.4
1979	17.8	1999	38.4
1980	18.6	2000	39.4

Data through 1985 from U.S. Department of Energy.

Data for 1986-2000 based on an annual increase of 1 MPG/year.

APPENDIX C: HISTORICAL DATA

Year	Illinois Population	Population 16-74	Licensed Drivers	Vehicles Registered	Passenger Cars	A/B Trucks	R-V's & Other Units*	(000's) Fuel Consump.	(000's) Annual VMT
1950	8,758,000	6,407,000	3,994,644	2,800,968	2,286,934	191,444	172,590	2,044,122	27,186,800
1951	8,790,000	6,428,000	3,791,880	2,650,968	2,406,080	203,364	180,102	2,186,572	29,343,796
1952	8,956,000	6,389,000	3,969,700	2,847,961	2,463,890	205,979	178,092	2,222,087	29,887,070
1953	9,065,000	6,424,000	4,219,242	2,958,824	2,580,313	212,677	165,834	2,315,778	30,545,112
1954	9,252,000	6,488,000	4,170,500	3,087,792	2,693,638	223,325	224,829	2,344,998	30,484,974
1955	9,435,000	6,571,000	4,254,313	3,268,398	2,858,029	233,075	187,294	2,551,090	32,807,017
1956	9,530,000	6,628,000	4,489,089	3,408,964	2,983,889	239,114	185,961	2,606,595	33,025,559
1957	9,668,000	6,793,000	4,586,045	3,513,182	3,075,578	244,953	192,651	2,754,925	34,546,760
1958	9,886,000	6,857,000	4,533,629	3,569,563	3,126,904	248,076	194,583	2,841,086	35,627,218
1959	9,986,000	6,781,808	4,538,406	3,678,322	3,221,127	255,787	201,408	2,916,547	36,281,845
1960	10,086,000	6,760,000	4,564,904	3,776,079	3,311,975	261,260	202,844	3,016,385	37,523,829
1961	10,130,000	6,830,000	4,585,638	3,858,237	3,388,771	266,897	202,569	3,102,038	38,558,332
1962	10,280,000	6,904,000	4,647,242	3,976,709	3,495,423	275,805	205,481	3,201,038	39,760,183
1963	10,402,000	6,977,000	5,228,632	4,105,402	3,606,672	286,146	212,584	3,329,627	41,420,560
1964	10,580,000	7,049,000	5,441,669	4,259,433	3,750,790	299,865	208,778	3,495,205	43,480,350
1965	10,693,000	7,128,000	5,596,806	4,437,191	3,900,016	317,013	220,162	3,649,763	45,585,540
1966	10,836,000	7,197,000	5,820,736	4,704,624	4,124,044	336,762	243,818	3,878,030	48,358,830
1967	10,947,000	7,274,000	5,801,527	4,818,259	4,204,955	357,892	255,412	3,998,771	49,784,699
1968	10,995,000	7,352,000	5,971,676	4,990,073	4,358,260	379,474	252,339	4,224,347	52,139,000
1969	11,039,000	7,430,000	5,689,165	5,162,398	4,507,915	374,208	280,275	4,418,060	54,165,400
1970	11,135,000	7,525,000	5,752,361	5,237,876	4,559,069	419,606	259,201	4,548,033	55,313,000
1971	11,179,000	7,746,000	5,903,167	5,417,021	4,707,141	443,161	272,719	4,673,175	56,746,000
1972	11,216,000	7,815,000	6,003,602	5,643,853	4,903,960	481,731	258,162	5,075,195	59,383,000
1973	11,177,000	7,809,000	6,124,554	5,951,948	5,120,721	526,587	304,640	5,302,382	60,772,000
1974	11,160,000	7,807,000	6,299,774	6,173,638	5,258,649	573,687	341,302	5,094,444	59,210,000
1975	11,197,000	7,862,000	6,389,533	6,343,875	5,350,375	606,819	386,681	5,243,371	60,943,000
1976	11,221,000		6,549,000	6,683,000	5,557,700	670,129	455,171	5,426,775	64,409,000
1977	11,249,000		6,742,000	6,838,028	5,711,800	722,962	403,266	5,587,000	66,947,000

*Separate data for R-V's are unavailable before 1973, so the data presented includes both R-V and other. R-V registrations are 1973= 47,493; 1974= 57,109; 1975= 74,640; 1976= 113,795; and 1977= 141,287.

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